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Unstable Intertrochanteric Femur Fractures: Is There a Consensus on Definition and Treatment in Germany?

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Abstract

Background Extramedullary and intramedullary implants have improved in recent years, although consensus is lacking concerning the definition and classification of unstable intertrochanteric fractures, with uncertainties regarding treatment.

Questions/purposes We conducted a national survey of practicing chairpersons of German institutions to determine current perspectives and perceptions of practice in the diagnosis, management, and surgical treatment of unstable intertrochanteric fractures.

Methods Between January and February 2010, we emailed 575 German chairpersons of trauma and/or orthopaedic departments, asking them to complete a 26-question web-based survey regarding three broad domains: fracture classification and instability criteria, implants and surgical treatment algorithms, and timing of operations. Response rate was 42%.

Results There was a clear preference for use of the AO/OTA fracture classification with geographic variations. Absence of medial support was considered the main criterion for fracture instability (84%), whereas a broken lateral wall and detached greater trochanter were considered by 4% and 5% of the respondents, respectively, to determine instability. Two percent routinely fixed unstable intertrochanteric fractures with extramedullary devices. Ninety-eight percent of German hospitals reportedly perform surgery within 24 hours after admission. Time to surgery was dependent on hospital level, with more direct surgeries in Level I hospitals.

Conclusions Despite varying opinions in the literature in recent years, we found some instability criteria (lateral wall breach, a detached greater trochanter) played a minor role in defining an unstable intertrochanteric fracture pattern.

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Each author certifies that his or her institution approved the human protocol for this investigation, that all investigations were conducted in conformity with ethical principles of research, and that informed consent for participation in the study was obtained.
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Despite recent meta-analyses suggesting clinical equivalence of intra- and extramedullary implants, few respondents routinely treat unstable intertrochanteric fractures with extramedullary plates. Additional studies are required to specify the influence of fracture characteristics on complication rate and function and to establish a classification system with clear treatment recommendations for unstable intertrochanteric fractures.

Level of Evidence Level V, expert opinion. See the Instructions for Authors for a complete description of levels of evidence.

Introduction

More than 30 years ago, Muhr et al. [31] highlighted the importance of appropriate treatment management of the geriatric patient with intertrochanteric fracture. They stated: "instability, osteoporosis and the requirement of early mobilization are the main problems in comminuted intertrochanteric fractures in elderly patients." They suggested acceptable reduction and stable internal fixation were prerequisites for uneventful bone healing and functional recovery. In 2012, orthopaedic trauma surgeons still search for the most appropriate treatment plan for these all too common fractures. Over the last 30 years, new techniques and implants reportedly have minimized complications while promoting early rehabilitation [2, 3, 13, 18, 21–24, 28, 35, 38–40, 43, 45]. The intramedullary hip screw (IMHS) has become a common internal fixation strategy, heralded for its biomechanical superiority [16, 25] and minimally invasive application [2, 3, 18, 21, 28, 38, 40, 45] compared to more traditional extramedullary techniques, such as the sliding hip screw (SHS) [2, 3, 5, 18, 23, 35, 37] or the newer locked minimally invasive plates [13, 21, 23, 24, 26, 39].

However, unstable intertrochanteric fractures in the elderly continue to be a tremendous public health problem in terms of patient mortality, morbidity, and burden to the healthcare system. Definitions of unstable fractures vary but include those with a fractured lesser trochanter [3, 21, 24, 30, 38], reverse fracture line or intertrochanteric comminution associated with a big posteromedial component [10, 11], a broken greater trochanter [34], and lateral cortex breach [14, 33]. Despite the use of current techniques and implants, treatment failure ranges from 0% to 20% [3, 21, 24, 28, 40, 45]. Several meta-analyses [2, 18, 35] suggest there is no superiority of one particular treatment paradigm over another. Furthermore, a primary arthroplasty must be considered, focusing on function and perioperative complication rate [6].

Several questions remain unanswered when treating elderly patients with unstable intertrochanteric fracture. First and foremost, the definition of an unstable intertrochanteric fracture pattern must be established so that treatment approaches can be compared. Several classification systems exist to distinguish stable from unstable fractures [11, 17, 30, 44], yet no system is universally used. Furthermore, van Embden et al. [44] have questioned the reproducibility of established classification systems. Second, the choice of implant and/or technique for the unstable intertrochanteric pattern is integral to provide stable fixation for early mobilization and uneventful fracture union. Third, surgeons need to determine how much time is reasonable to delay surgery to ensure these often fragile patients are in the best possible medical condition. Current guidelines recommend hip fracture surgery be performed within 24 hours of injury to achieve reduction of pain and lower complication rates [7, 29, 32, 42].

In general, the daily treatment practice of unstable intertrochanteric fractures with respect to the definition of instability and acute surgical treatment is unknown in Germany. Particularly, regional variations (east, west, south) and differences due to the hospital level (Levels I–III, similar to the American College of Surgeons trauma center designations [8]) are demanding.

We therefore conducted a national survey of practicing chairpersons to clarify current opinion and practice in the treatment of unstable intertrochanteric fractures in Germany. Surgeons were surveyed to determine the extent to which there was a consensus on (1) using the established classification systems defining instability criteria and (2) the procedure of implant selection with identification of the main problems in treatment. We also (3) determined the time from patient admission to surgery.

Materials and Methods

Two of us (MK, GG) developed a questionnaire using consultants, epidemiologists, and the scientific literature to examine surgeons' preferences and practices in the management of unstable intertrochanteric fractures. The questionnaire was based on three broad categories: (1) fracture classification including instability criteria, (2) implants and surgical treatment algorithms, and (3) timing of operation. Institutional review board approval was granted before initiation of this study, and strict confidentiality guidelines were followed.

The items generated from expert opinions (31 items) were substantiated by scientific data using focus groups [20]. Pooling of items after exclusion of repetitions left 20 items. A comprehensive search of the Ovid MEDLINE® database published in the English literature was performed. Search terms were altered according to the method of subheading mapping: Ovid MEDLINE®: 1980 to 2011: 1. exp Unstable intertrochanteric fractures/, 2. (Trochant$ or

pertrochant$ or proximal femur$) adj4 unstable fracture).tw., 3. or/1–2, 4. (nail$ or screw$ or plate$ or arthroplast$ or fix$ or prosthes$).tw., 5. Internal fixators/ or Bone screws/ or Fracture fixation, Internal/ or Bone plates/ or Bone nails/ 6. Arthroplasty/ Replacement, 7. or/4–6, 8. Complications/ 9. Fracture classification and stability/, 10. Timing surgery/, 11. and/3,7,8, 12. and/3,8,9, 13. and/3,10. Using these terms, we found 89 articles. Limiting to English language and humans left 66 articles. We selected studies pertaining to fracture classification, stability criteria, implants and surgical treatment, and timing of surgery. Those articles outside the scope of unstable intertrochanteric fractures, as well as case reports about specific therapies, outcomes, and diagnoses, were excluded. We examined relevant references from each of the remaining articles for inclusion. Articles were then crossreferenced to discard repeated references, leaving 32 orthopaedic articles. Synthesizing the items focused in the literature with the items generated from experts led to a 26-item questionnaire.

We pretested the questionnaire for clarity, relevance, comprehensiveness, and ease of completion. Pretesting was conducted in two parallel groups (west/east Germany [n = 10] and south Germany [n = 8]) of orthopaedic surgeons with experience in research and trauma to evaluate the following questions: (1) Does the questionnaire as a whole appear to adequately address the question of current practice in treating unstable intertrochanteric femur fractures (face validity [12])? And (2) do the individual questions adequately reflect the three broad categories of fracture classification/instability criteria, surgical treatment options, and time to surgery (content validity)? Each of the 18 surgeons responded to the following question for each item: Is the skill or knowledge measured by this item "essential," "useful, but not essential," or "not necessary" to the performance of the construct? According to Lawshe [27], if more than ½ of the panelists indicate an item is essential, that item has at least some content validity. Responses were incorporated in the final version by modifying the preformulated answers (minor changes) for better understanding and clarity (instability criteria, fracture classification).

The final questionnaire included three types of questions: single choice (19 questions), multiple choice (three questions; instability criteria and implant selection) with five to six response options, and a few open questions permitting unlimited answer length (demographics, main problems in fracture treatment) (Appendixes 1, 2; supplemental materials are available with the online version of CORR®). A previous report has shown closed-ended questions result in fewer incomplete responses than open-ended questions [15]. The survey also included questions regarding hospital sizes, hospital levels in Germany [8], geographic locations, department characteristics, and number of intertrochanteric femur fractures treated per year (self-reported measures) (Table 1). Items 1 to 3 contained questions about demographic data, Item 4 timing of surgery [1, 7, 29, 32, 42], Items 5 and 6 classification systems (including AO/OTA [30] and Evans [11]) and instability criteria [11, 17, 30, 44], Items 7 to 10 implant selection, Items 11 to 15 surgeon, patient positioning, and estimation of surgical and radiographic screening time, Items 16 to 18 weightbearing, hospitalization time, and discharge procedure, Item 19 expected complications, Items 20 and 21 importance of cement augmentation and minimally invasive extramedullary systems [13, 21, 23, 24, 26, 39], Items 22 to 24 radiographic evaluation, reoperation rate, and importance of outcome scores, Item 25 main problems in unstable intertrochanteric fracture treatment, and Item 26 willingness to participate in a multicenter study.

Table 1. Demographic data of the respondents

Characteristic	Number of respondents (n = 239)
Geographic region in Germany	
West (population: 42 million)	121 (51%)
East (formerly East Germany; population: 16.3 million)	51 (21%)
South (Baden-Würtemberg, Bayern; population: 23.2 million)	48 (20%)
Unspecified	19 (8%)
Hospital level (American College of Surgeons trauma center designation [8])	
Level I	88 (37%)
Level II	111 (46%)
Level III	27 (11%)
Unspecified	13 (5%)
Department specialization	
Orthopaedic trauma (mean ± SD number of beds: 63 ± 27)	107 (45%)
Trauma (mean ± SD number of beds: 53 ± 23)	75 (31%)
General surgery (mean ± SD number of beds: 59 ± 32)	57 (24%)
Number of intertrochanteric fractures treated at institutions per year	
< 20	4 (2%)
20–50	65 (27%)
51–80	83 (35%)
81–120	58 (24%)
> 120	29 (12%)

Between January and February 2010, we emailed German chairpersons of trauma and/or orthopaedic departments, asking them to complete the web-based survey (SurveyMonkey®). We recruited hospitals via the German hospital address book [9]. All university hospitals, Kliniken der Berufsgenossenschaft (hospitals funded by the association of employers' liability insurance association in Germany),

and university teaching hospitals (peripheral independent hospitals with teaching assignments from universities) with trauma surgery departments were included. Furthermore, all hospitals with trauma surgery departments and more than 30 clinic beds were contacted. Using these strategies, we identified 575 hospitals. We sent an email to the chairperson of each of these 575 orthopaedic trauma units with a link and personal access code to the online survey. We contacted 414 initial nonresponders again via email and telephone at 6 and 12 weeks after the initial invitation. Completed questionnaires were received from 255 German chairpersons (response rate, 44%). Sixteen partially completed questionnaires were excluded (< 80% of the questions were answered). These initial exclusions left 239 questionnaires out of the review (actual response rate, 42%). The majority of respondents (83%) were from Level I and II trauma centers (Table 1). More than 70% of the clinics treated more than 50 patients/year (Table 1).

We summarized continuous data (estimation of surgical and radiographic screening time and blood cell usage) using means and corresponding SDs and categorical and dichotomous data using frequencies and percentages (other items in questionnaire). We determined differences in respondents' opinions regarding (1) fracture classification systems defining instability criteria, (2) the procedure of implant selection with identification of the main treatment problems, and (3) timing of surgery between the various hospital levels (Levels I–III) and between the geographic location (east, west, or south) using Fisher's exact test. Estimation of surgical time, radiographic screening time, and blood cell usage between the different hospital levels was analyzed using ANOVA. We performed all analyses using SAS/STAT® software (Version 9.2; SAS Institute Inc, Cary, NC, USA).

Results

The AO/OTA scheme was the most widely used classification system; however, in some parts of west and south Germany, fractures were also classified by the simplified criterion of stable versus unstable, determined by the presence or absence of a fractured lesser trochanter. Other classifications, such as the Evans classification [11], were rarely used (Table 2). Most respondents (82%) used the absence of medial calcar support (equivalent of a fractured lesser trochanter) as the main criterion for instability. Only 5% and 4% of respondents, respectively, specified a fractured greater trochanter and the existence of a broken lateral femoral wall as notable criteria for fracture instability. We found no geographic differences with regard to the determination of fracture instability (Table 2).

The choice of implant was left to the surgeons' discretion in the majority of hospitals (67%–83%) (Table 3).

Table 2. Fracture classification and instability criteria of intertrochanteric fractures according to geographic location

Variable	Number of respondents by region			p value
	East (n = 51)	West (n = 121)	South (n = 48)	
Fracture classification				
AO/OTA	45 (88%)	78 (65%)	35 (73%)	0.006
Evans classification	0 (0%)	5 (4%)	2 (4%)	
Broken lesser trochanter	3 (6%)	33 (27%)	10 (21%)	0.006
Otherwise characterized	1 (2%)	1 (1%)	0 (0%)	
No classification	1 (2%)	2 (2%)	0 (0%)	
Instability criteria				
Medial support	43 (84%)	102 (84%)	41 (85%)	
Dislocated lesser trochanter	3 (6%)	3 (2%)	1 (2%)	
Broken greater trochanter	3 (6%)	8 (7%)	1 (2%)	
Broken lateral wall	1 (2%)	5 (4%)	4 (8%)	
Always unstable	1 (2%)	3 (2%)	1 (2%)	

Respondents generally reported they were personally responsible for implant selections and surgical procedures in Level III hospitals (Table 3). In 11% to 31% of cases, the resident performed the surgery under supervision (Table 3). Two-thirds of respondents stated less than 3% of patients required reoperations (self-reported estimate) (Table 4). The majority of respondents (96%) agreed unstable intertrochanteric femur fracture should be stabilized with IMHSs; only 2% would routinely address these fractures with an extramedullary device (intramedullary implant: n = 229; extramedullary implant: n = 4; either implant: n = 6). Unstable fractures were reportedly treated only with extramedullary devices (SHS, SHS/trochanteric stabilization plate) in 8% to 19% of cases. There were distinct regional differences with respect to the type of IMHS used (Fig. 1). An IMHS with a large bore partially threaded into the head neck segment was predominantly used in the east and west, whereas a spiral blade was more frequently used in the south (Fig. 1). Depending on hospital level, 22% to 36% of respondents believed obtaining and maintaining fracture reduction was the most challenging part of caring for patients with unstable intertrochanteric fractures (Table 4). Currently available implants and operative techniques (23%–44%) were implicated as the main treatment problem (Table 4); respondents at less experienced Level III centers reported this most frequently (44%).

Level I hospitals reported shorter (p = 0.001) times to surgery than Level II and III hospitals (self-reported estimate) (Table 5). We found no difference in the times to surgery geographically.

Table 3. Operative procedures according to hospital level

Question	Value by hospital level			p value
	Level I (n = 88)	Level II (n = 111)	Level III (n = 27)	
Selection of implant in most cases (number of respondents)				
Consultant-based on stability criteria	69 (78%)	92 (83%)	18 (67%)	0.172
Consultant-based on preference	9 (10%)	5 (5%)	2 (7%)	0.293
Resident-based on stability criteria	2 (2%)	1 (1%)	0 (0%)	
Chief-based on preferences	8 (9%)	13 (12%)	7 (26%)	0.064
Who is the surgeon in most cases? (number of respondents)				
Chief	0 (0%)	13 (12%)	7 (26%)	0.001
Consultant	40 (45%)	55 (50%)	15 (56%)	0.774
Resident alone	1 (1%)	0 (0%)	0 (0%)	
Resident under supervision	27 (31%)	24 (22%)	3 (11%)	0.083
Depends on fracture type	16 (18%)	18 (16%)	2 (7%)	0.406
Unspecified	4 (5%)	1 (1%)	0 (0%)	
What is your estimation of surgical time (minutes)?*	60 (24)	54 (18)	53 (18)	0.079
What is your estimation of radiographic screening time (minutes)?*	1.6 (0.4)	1.7 (0.5)	1.9 (0.5)	0.019
What is your estimation of blood cell package usage (units)?*	0.6 (0.9)	0.7 (0.8)	0.5 (0.8)	0.687

* Values are expressed as mean, with SD in parentheses.

Table 4. Main treatment problem, cement augmentation, and reoperation rates according to hospital level

Question	Number of respondents by hospital level			p value
	Level I (n = 88)	Level II (n = 111)	Level III (n = 27)	
What is the main problem in intertrochanteric fracture treatment?				
Reduction	32 (36%)	40 (36%)	6 (22%)	0.358
Implants and operative technique	21 (24%)	25 (23%)	12 (44%)	0.057
Osteoporosis	7 (8%)	12 (11%)	3 (11%)	0.771
Postoperative morbidity	13 (15%)	17 (15%)	3 (11%)	0.856
Rehabilitation	5 (6%)	11 (10%)	2 (7%)	0.546
Unspecified	10 (11%)	6 (5%)	1 (4%)	
Do you agree with the benefit of using cement augmentation techniques for hip fracture implants?				
Yes	15 (17%)	8 (7%)	2 (7%)	0.072
No	58 (66%)	86 (76%)	22 (82%)	0.111
With limitations	10 (11%)	14 (13%)	3 (11%)	0.955
Unspecified	5 (6%)	3 (3%)	0 (0%)	
What is your estimate of reoperation rate?				
< 1%	16 (18%)	34 (31%)	6 (22%)	0.123
1%–3%	38 (43%)	51 (46%)	14 (52%)	0.726
3%–5%	19 (22%)	17 (15%)	5 (19%)	0.522
5%–10%	8 (9%)	3 (3%)	1 (4%)	
10%–15%	2 (2%)	1 (1%)	1 (4%)	
> 15%	4 (5%)	1 (1%)	0 (0%)	
Unspecified	5 (6%) 1(1)	3 (3%) 0(0)	0 (0%)	

Discussion

Several meta-analyses [2, 18, 35] have suggested there is no superiority of one particular treatment paradigm over another in the treatment of unstable intertrochanteric femur fractures. Although each year sees various modifications and improvements in implant types and operating techniques, these unstable fractures are still associated with a mechanical complication rate of 0% to 20% [3, 21, 24, 28, 40, 45]. Several questions remain unanswered, especially

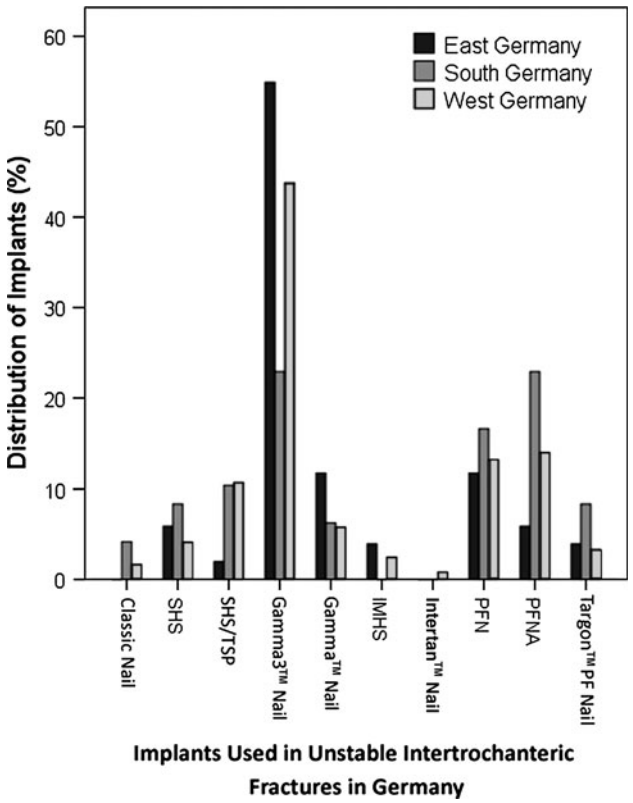

Fig. 1 The graph shows the distribution of implants used in stabilization of unstable intertrochanteric femoral fractures in Germany (multiple answers were permitted). TSP = trochanteric stabilization plate; PFN = Proximal Femoral Nail™; PFNA = Proximal Femoral Nail Antirotation™.

Table 5. Time to surgery according to hospital level

Question	Number of respondents by hospital level			p value
	Level I (n = 88)	Level II (n = 111)	Level III (n = 27)	
When is surgery performed after patient admission in most cases?				
Directly, also at night	37 (42%)	23 (21%)	4 (15%)	0.001
After 6–12 hours	25 (28%)	57 (51%)	8 (30%)	0.002
After 12–24 hours	24 (27%)	29 (26%)	15 (56%)	0.008
Up to 48 hours	2 (2%)	2 (2%)	0 (0%)	

regarding the definition of an unstable fracture pattern and the coexistence of several classification systems. Furthermore, time to surgery plays an important role in fragility fracture treatment to avoid complications and high mortality rates. Unaware of the daily treatment practice of unstable intertrochanteric fractures in Germany, we conducted a national survey of practicing chairpersons to clarify current opinion and practice, according to geographic and hospital level criteria, in (1) using the established classification systems defining criteria for fracture instability, (2) the procedure of implant selection with identification of the main problems in treatment, and (3) timing of surgery.

Despite our consistent findings from the orthopaedic departments represented in our study, there were several limitations to our study. First, surveys have potential limitations because of responder bias. Those participants choosing not to respond may have given different answers. Responder bias is less likely when survey response rates exceed 50% [41]. The low response rate (42%) to this survey did not reduce concern that responder bias could be a substantial source of error in this survey. For this reason, defining a broad national picture regarding the treatment of unstable intertrochanteric fractures in Germany is not possible from these data. However, the survey adequately represents current treatment perspectives and perceptions of more than 200 chairpersons in Germany. Further, focusing primarily on the opinions of respondents in chair positions may not have ideally reflected actual treatment preferences of experienced community surgeons in general and we had no way to control for possible discrepancies between stated and actual treatment approaches. However, given that we had contacted mostly surgeons working in academic centers and in Level I and II German hospitals, our findings may have reflected the preferences of surgeons working in hospitals with state-of-the-art fracture treatment and with chairpersons keeping up to date. Second, the questionnaire design was limited by the reliance on self-reported information. We tried to control for this by using closed-ended questions to allow for better comparability. However, we acknowledge this type of question limited the scope of responses, allowing respondents to circle responses rather than to provide the information de novo. The nature of the questionnaire did not allow respondents to report responses that did not appear on the questionnaire. In such a way, respondents could not vote for an arthroplasty in treatment of unstable intertrochanteric fractures. We tried to account for these shortcomings by providing additional fields for comments and suggestions. Unfortunately, there was a limited use of these additional fields by the respondents. Therefore, we did not incorporate these additional comments in our findings and results. In regard to the item "treatment choices of unstable intertrochanteric fractures," nine respondents gave additional comments, none of them regarding possible treatment with arthroplasty. However, the survey was externally validated by experienced German orthopaedic surgeons, who verified the response choices. Furthermore, the use of a rigorous process for the development of the questionnaire items with active surgeon participation should have limited this kind of error by including all nationally important response choices. Additionally, we mainly used single-selection questions, and only the participant's most relevant option for a standard

situation was detected. Two or more answers were not allowed, which may have distorted the response picture. However, use of the comment field was always possible, limiting this bias. A final limitation is that we did not study patient ages, levels of activity, or comorbidities as variables that may influence clinical decision making. Therefore, the study findings gave a review without taking special clinical situations into consideration. In general, intertrochanteric fracture treatment includes patients with advanced age, and other factors such as social dependence, cachexia, anemia, cognitive dysfunction, and additional comorbidities lead to a high mortality rate [7, 19, 29, 32, 42].

Despite the potential for bias, our data suggest the AO/OTA classification is widely used in Germany (65%–88% of hospitals) and other instability criteria (lateral wall breach, detached greater trochanter, comminution of the posteromedial cortex) played a secondary role. The AO/OTA classification is more commonly used in the eastern part of Germany, whereas elsewhere fractures are classified by the presence or absence of a fractured lesser trochanter (A2 equivalent). A fracture classification system should provide information on fracture stability and guide the choice of treatment [44]. The Evans classification [11] describes the location of the fracture line and the fracture stability, and the AO/OTA classification [30] is designed to provide prognostic information on achieving and maintaining reduction [44]. Classifications with poor reliability and contradictory reports in the literature cause confusion concerning fracture stability, with consequences for implant selection in the case of an unstable intertrochanteric fracture [17, 36, 44], and both the AO/OTA and Evans classifications have poor reproducibility [44]. van Embden et al. [44] showed the reproducibility of the AO/OTA classification is improved when subgroups of the classification are not provided. Consequently, there was high interobserver agreement in our study when medial cortical comminution was used as the main instability criterion of an unstable intertrochanteric fracture. Inherently unstable fracture patterns in mainly osteoporotic bone in conjunction with the quality of the reduction and screw positioning in the femoral head-neck fragment predispose to many complications, including implant cut-out [4, 16]. Certain characteristics are generally considered unstable, such as reversed oblique fractures, four-part fractures, and all fractures with medial cortical comminution, but evidence for these assumptions is weak [10, 11, 30, 44]. AO/OTA 31-A1 fractures are considered stable, and the SHS is still considered the gold standard for these fractures [3, 30, 35]. The A2 and A3 types are considered unstable, but the degree of fracture instability and adequate treatment of both types remain controversial [33, 34, 44]. These results are supported by our findings. Most respondents used the absence of medial calcar support (equivalent of A2 fracture, without analysis of subgroups) as the main criterion for instability. Only a few respondents specified a fractured greater trochanter and the existence of a broken lateral femoral wall (A3 equivalent, reversed fracture line) as notable criteria for fracture instability. It is surprising that the surveyed expert group did not recognize lateral cortex breach in this context. Recent studies by Palm et al. [33] and Gotfried [14], however, implied the key role of an intact lateral femoral wall in the fixation of trochanteric femur fractures, which was an important predictor of reoperation rates and led to instability. These mainly reverse fracture patterns are difficult to treat, especially when associated with a medial component. That is why these reversed fractures with a broken lateral wall should be fixed with current intramedullary systems [14, 21]. As a detached greater trochanter appears to be a key element for stability and the choice of implant, current classifications may need to be revised accordingly [34, 44]. Palm et al. [34] recommended using a short intramedullary nail if the lateral wall seems fragile or the greater trochanter is detached. Only 4% of the respondents in west and south Germany are using the Evans classification of intertrochanteric fractures. In this scheme, a fractured lesser trochanter is considered a stable fracture pattern (Evans 2) in contrast to the AO/OTA scheme [11]. Also, in the Evans classification, unstable fracture patterns are characterized by greater comminution of the posteromedial cortex—an instability criterion not mentioned by our respondents. The reverse obliquity pattern with a fractured lateral wall (Evans 5) is considered inherently unstable because of the tendency for medial displacement of the femoral shaft [11, 25].

The treatment for unstable intertrochanteric femur fractures is unclear and has been associated with a mechanical complication rate of 0% to 20% [3, 21, 24, 28, 40, 45]. An reoperation rate of less than 3% by only ⅔ of our respondents seems questionable. Since the estimates in this survey were self-reported, this may be a topic for randomized clinical multicenter studies in the future. Another explanation could be the fact that there is a low clinical and radiographic followup rate regarding these fragile patients with many comorbidities [7, 19, 29, 32, 42]. Our survey suggested only 2% of respondents would always manage unstable intertrochanteric fractures with extramedullary plate systems, although a number of studies [3, 18, 21, 35, 38] have reported no difference in the reoperation rates after treatment with an intramedullary or extramedullary device. Lateral cortex breaches in A3 fracture equivalents treated with a SHS are associated with higher failure rates [13, 14]. In the Cochrane meta-analysis [35], however, the extramedullary system (SHS) was associated with lower complication rates and considered superior to intramedullary implants despite the absence of functional data. The widespread usage of an IMHS in

Germany is perhaps the result of a perceived improvement in implant design and the biomechanical advantages of intramedullary fixation. Complication rates after use of the newer modified nails (blades, optimized anatomic design) appear to be lower in comparison to those of older nail generations [3, 21, 28, 40, 43, 45]. In this context, the authors of the Cochrane meta-analysis recommended further comparative studies with new-generation nails and sliding extramedullary devices, especially for unstable fracture subgroups [35]. One of the more promising innovations uses nails with a blade instead of a screw for the head and neck fragment, with promising results in the first clinical studies [21, 28, 40, 43, 45]. Given a region-dependent usage of implants in our study, a blade design was used predominantly in the south. Maybe this asymmetrical implant distribution in Germany (Proximal Femoral Nail Antirotation™; Synthes, Umkirch, Germany; Gamma3™ nail; Stryker, Freiburg, Germany) is due to contractual relationships of the companies rather than preferences of surgeons. Distribution and sales of all AO products is done through Synthes, which has been strong in the south historically. Blade usage [28, 40] has been heralded as a promising innovation to prevent the dreaded cut-out. Recent randomized studies [43, 45], however, showed no differences in complications and functional outcomes between the standard and blade designs, with reoperation rates between 0% and 3%. Locked minimally invasive plating also potentially could reduce the complication rate [13, 14, 21, 23, 24, 26, 39]. It seems advantageous in reducing intraoperative lateral wall fractures (A3 equivalent) [14, 21, 26] and in treating patients with poor bone quality or osteoporosis [23]. Surprisingly, there was no comment regarding this innovative technique by the respondents in our survey. Such techniques are becoming more popular in modern orthopaedic trauma as they, at least theoretically, are associated with less postoperative pain, lower risk for postoperative morbidity, and rapid rehabilitation [13, 14]. Cut-out of the lag screw still appears to be a relevant problem (3%–7%) for new-generation intramedullary therapy [28], especially with eccentric placement [4] and inadequate reduction [21, 37]. Our survey respondents emphasized that quality of reduction must not be overlooked as a key feature for success when treating unstable intertrochanteric fractures. Presumably, the principles proposed by Muhr et al. [31] in 1979 are relevant in 2012. The varus malreduction has been clearly implicated in nonunions and early treatment failures [21, 37]. Fracture reduction and implant positioning are directly related, with correct reduction being the prerequisite to correct implant placement. Currently available implants and operative techniques were stated as the main treatment problem, especially at less experienced Level III centers, implicating a substantial learning curve. New techniques might be regarded as technically more challenging, such as minimally invasive procedures [13, 39, 40] or innovative procedures that require a meticulous insertion technique [22]. A recent study suggests surgeon-related risk factors are more relevant for the reoperation rate after fixation with minimally invasive plates when compared with patient-related risk factors [39]. Assuming the resident performs the surgery (under supervision) in ⅓ of cases in Germany, with only 11% in Level III hospitals, failure to master this learning curve may add to risk.

We found 98% of respondents treating intertrochanteric femur fractures in Germany reportedly perform surgeries within 24 hours after admission. In Level I hospitals, surgery is reportedly performed earlier. One possible explanation is the higher number of attending physicians on call in these facilities. There is widespread evidence in the literature [7, 19, 29, 32, 42] that morbidity, incidence of pressure sores, and length of hospital stay could be improved by shortening the waiting time of hip fracture surgery. In Germany, early surgical treatment of elderly patients with proximal femoral fracture is preferred and recommended by the guidelines of the German Traumatology Society (Deutsche Gesellschaft für Unfallchirurgie) [1]. In fact, several guidelines [7, 29, 32, 42] recommend performing surgery as soon as possible, suggesting early surgery is associated with better functional outcome, shorter duration of pain, and fewer complications. Certainly, the risk of prolonged recumbency must be balanced versus injudicious early surgical intervention in this often sick patient population [29]. Nevertheless, it remains unclear as to which patients would benefit from delay and further medical evaluations. New research projects should be directed to identify those patients.

The definition of an unstable intertrochanteric fracture pattern must be established so that treatment approaches can be compared. Surprisingly, and despite different findings in the literature, our surveyed expert group did not recognize lateral cortex breach, a fracture of the greater trochanter, or a posteromedial comminution as a risk factor defining an unstable intertrochanteric fracture. The lateral cortex has been largely uncontested as a factor that renders an intertrochanteric fracture unstable [14, 26]. Only 2% of German chairpersons would routinely manage unstable intertrochanteric fractures with extramedullary plate systems. In recent meta-analyses [18, 35], however, the extramedullary system (SHS) was associated with lower complication rates and considered superior to intramedullary implants. Despite reported mechanical complication rates of 0% to 20% [3, 21, 24, 28, 40, 45], ⅔ of our respondents stated less than 3% of patients required reoperations. Additional studies are required to specify the influence of certain fracture characteristics on complication rate and function, establishing a universally used classification system with clear treatment recommendations in unstable intertrochanteric fractures.

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